

NON-PUBLIC?: N  
ACCESSION #: 9412060114  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Palo Verde Unit 2 PAGE: 1 OF 6

DOCKET NUMBER: 05000529

TITLE: Reactor Trip on Low DNBR Due to Erroneous Penalty Factor  
EVENT DATE: 10/29/94 LER #: 94-006-00 REPORT DATE: 11/23/94

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:  
NAME: Burton A. Grabo, Section Leader, TELEPHONE: (602) 393-6492  
Nuclear Regulatory Affairs

COMPONENT FAILURE DESCRIPTION:  
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:  
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

#### ABSTRACT:

On October 29, 1994, at approximately 2044 MST, Palo Verde Unit 2 was in MODE 1 (POWER OPERATION), operating at approximately 100 percent power when the reactor tripped on a low Departure from Nucleate Boiling Ratio (DNBR) trip signal. The trip signal was initiated from the Core Protection Calculators (CPC) after processing an erroneous DNBR penalty factor generated by Control Element Assembly Calculator (CEAC) #1. Required plant equipment and safety systems responded to the event as designed. No Engineered Safety Features actuations occurred and none were required. The Shift Supervisor diagnosed the event as an uncomplicated reactor trip. By approximately 2115 MST on October 29, 1994, the plant was stabilized in MODE 3 (HOT STANDBY).

The reactor trip was caused by an apparent malfunction in a processor board located in CEAC #1. As corrective action, the processor board was quarantined and replaced. An Equipment Root Cause Failure Analysis

(ERCFA) was initiated on the processor board.

A previous similar event was reported in LER 528/89-004.

END OF ABSTRACT

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## I. DESCRIPTION OF WHAT OCCURRED:

### A. Initial Conditions:

On October 29, 1994, at 2044 MST, Palo Verde Unit 2 was in MODE 1 (POWER OPERATION) operating at approximately 100 percent power.

### B. Reportable Event Description (Including Dates and Approximate Times of Major Occurrences):

Event Classification: An event that resulted in the automatic actuation of the Reactor Protection System (RPS) (JC).

On October 29, 1994, at approximately 2044 MST, Palo Verde Unit 2 was in MODE 1 (POWER OPERATION), operating at approximately 100 percent power when the reactor tripped on a low Departure from Nucleate Boiling Ratio (DNBR) trip signal. The trip signal was initiated from the Core Protection Calculators (CPC) (JC) after processing an erroneous DNBR penalty factor generated by Control Element Assembly Calculator (CEAC) #1 (JC). Required plant equipment and safety systems responded to the event as designed. No Engineered Safety Features (JE) actuations occurred and none were required. The Shift Supervisor diagnosed the event as an uncomplicated reactor trip. By approximately 2115 MST on October 29, 1994, the plant was stabilized in MODE 3 (HOT STANDBY).

Just prior to the reactor trip, several Control Element Assembly Calculator (CEAC) #1 Fail and CPC Sensor Failure alarms (IB) were received in the Control Room. One function of the CEACs is to generate a DNBR penalty factor for the CPCs when Control Element Assembly (CEA) (AA) position deviations are detected. An apparent malfunction in a processor board located in CEAC #1 generated an erroneous DNBR penalty factor causing all 4 CPC channels to alarm and initiate a reactor trip signal. The reactor tripped on low DNBR. Required plant

equipment and safety systems performed as designed. No Engineered Safety Features Actuation System (JE) functions were activated. The

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Shift Supervisor diagnosed the event as an uncomplicated reactor trip. By approximately 2115 MST on October 29, 1994, the plant was stabilized in MODE 3 (HOT STANDBY).

C. Status of structures, systems, or components that were inoperable at the start of the event that contributed to the event:

Although CEAC #1 generated an erroneous DNBR penalty factor, there were no indications that any structures, systems, or components were inoperable at the start of the event which contributed to the event.

D. Cause of each component or system failure, if known:

Initial troubleshooting was not successful in isolating a specific failed subcomponent on the CEAC #1 processor board. By evaluating available data (obtained from the auto-restart log Point IDs PID!, sensor status word PIDS, failed sensor stack PIDS, CPC and CEAC trip buffers, and the plant computer alarm printer logs), Control Room Operator observations, and past CEAC failures, APS Engineering personnel determined that an apparent malfunction in a processor board caused CEAC #1 to generate an erroneous DNBR penalty factor. The CPCs correctly processed the erroneous DNBR penalty factor and initiated a reactor trip signal as designed. The processor board was quarantined. An independent investigation of the processor board was initiated to determine the root cause of failure.

E. Failure mode, mechanism, and effect of each failed component, if known:

The apparent malfunction in the processor board resulted in CEAC #1 sending an erroneous penalty factor to the CPCs which, in turn, generated a low DNBR trip signal and initiated the reactor trip.

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F. For failures of components with multiple functions, list of systems or secondary functions that were also affected:

Not applicable - no failures of components with multiple functions were involved.

G. For a failure that rendered a train of a safety system inoperable, estimated time elapsed from the discovery of the failure until the train was returned to service:

Not applicable - no failures that rendered a train of a safety system inoperable were involved.

H. Method of discovery of each component or system failure or procedural error:

Engineering concluded that the processor board located in CEAC #1 had apparently malfunctioned based on an evaluation of available data, Control Room Operator observations, and past equipment failures that exhibited similar failure symptoms. There were no procedural errors which contributed to this event.

I. Cause of Event:

The cause of the reactor trip was attributed to an apparent malfunction in the processor board located in CEAC #1 which sent an erroneous penalty factor to the CPCS. All 4 CPC channels processed the erroneous penalty factor and generated a low DNBR trip signal (SALP Cause Code X: Other).

J. Safety System Response:

Not applicable - there were no safety system responses and none were necessary.

K. Failed Component Information:

The processor board on CEAC #1 is a Concurrent Computer Corporation model number 3117150-01, serial number 195.

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L. Assessment of the Safety Consequences and Implications of this Event:

The low DNBR trip is provided to prevent the DNBR in the limiting coolant channel in the core from exceeding the fuel design limit in the event of design bases anticipated operational occurrences.

The reactor trip occurred when all 4 channels of CPCs calculated a DNBR value that exceeded the low DNBR trip setpoint. The CPC calculated DNBR resulted from an erroneous penalty factor generated in CEAC #1 due to an apparent malfunction in the processor board. The actual DNBR safety limit was not exceeded.

Primary and secondary pressure boundary limits were not approached due to the reactor tripping from a steady state condition, followed by a "quick open" of the Steam Bypass Control System (JI). The transient did not cause any violation of the Specified Acceptable Fuel Design Limits. Therefore, there were no safety consequences or implications as a result of this event. This event did not adversely affect the safe operation of the plant or health and safety of the public.

### III. CORRECTIVE ACTION:

#### A. Immediate:

Control Room Operator action was taken to place the reactor plant in a stable condition in accordance with the appropriate operating procedures.

Initial troubleshooting was conducted but was not successful in isolating a specific failed subcomponent. APS Engineering evaluated available data, Control Room Operator observations, and past CEAC failures, and determined that an apparent malfunction in a processor board caused CEAC #1 to generate an erroneous DNBR penalty factor. The CPCs correctly processed the erroneous DNBR penalty factor and initiated a reactor trip signal. The processor board was quarantined. An independent investigation of the event and a separate independent

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investigation for the processor board are being conducted in accordance with the APS Incident Investigation Program.

#### B. Action to Prevent Recurrence:

The CEAC #1 processor board was replaced.

As part of the investigation, an ERCFA of the processor board is being performed by APS Engineering. The preliminary evaluation has not identified any specific subcomponent failure(s) which would cause the CEAC processor board to malfunction. If information is developed that would significantly affect the readers' understanding or perception of this event, a supplement will be submitted.

#### IV. PREVIOUS SIMILAR EVENTS:

A reactor trip resulting from a CEAC generating an erroneous DNBR penalty factor was previously reported in LER 528/89-004. The root cause of the 1989 reactor trip was identified, through troubleshooting, as a failure of a CEAC processor board's arithmetic logic unit integrated circuit.

The ERCFA being performed on the processor board from CEAC #1 for this event (LER 529/94-006), has not isolated the cause(s) of the malfunction. Both events were similar in that the reactor tripped on low DNBR due to erroneous penalty factors; however, a similar cause for the CEAC processor boards to generate an erroneous penalty factor has not been established.

ATTACHMENT TO 9412060114 PAGE 1 OF 1

Arizona Public Service Company  
PALO VERDE NUCLEAR GENERATING STATION  
P.O.BOX 52034 o PHOENIX, ARIZONA 85072-2034

192-00914-JML/BAG/DLK  
JAMES M. LEVINE November 23, 1994  
VICE PRESIDENT  
NUCLEAR PRODUCTION

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Mail Station P1-37  
Washington, DC 20555

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)  
Unit 2  
Docket No. STN 50-529 (License No. NPF-51)

Licensee Event Report 94-006-00  
File: 94-020-404

Attached please find Licensee Event Report (LER) 94-006-00 prepared and submitted pursuant to 10 CFR 50.73. This LER reports a reactor trip on low Departure from Nucleate Boiling Ratio (DNBR) which was attributed to an apparent malfunction in a Control Element Assembly Calculator (CEAC) processor board. In accordance with 10 CFR 50.73(d), a copy of this LER is being forwarded to the Regional Administrator, USNRC Region IV.

If you have any questions, please contact Burton A. Grabo, Section Leader, Compliance, at (602) 393-6492.

Sincerely,

JML/BAG/DLK/pv

Attachment

cc: L. J. Callan  
K. E. Perkins  
K. E. Johnston

\*\*\* END OF DOCUMENT \*\*\*

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